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UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for

SOIL CONSERVATION SERVICE RESEARCH**
OCTOBER 1950

EROSION CONTROL PRACTICES DIVISION

Potato Harvester - John W. Slosser, Orono, Maine.-"Measurements and data taken during the testing of the experimental potato harvester are being prepared. Some outstanding results are noted. In a field yielding somewhat over seventeen tons of potatoes per acre, the harvesting rate was well over four acres per day or 8.5 tons per hour. Normally, a crew of seven or eight pickers (total crew of nine to ten), digging with one-row diggers, harvests at the rate of 4.14 tons per hour. A crew of eight was used on the harvester. This represents an average labor efficiency increase of better than four tons per hour or approximately double the usual man-day output. The above represents maximum capacity of the machine based on runs of approximately 1500 feet. During the course of a running day, the average output will vary from sixty to seventy-five per cent of the maximum rate, depending upon time loss for stone removal, adjustments, turning, replenishing bag supply, etc.

"It is of interest that in the field used for these tests, the material (stones and potatoes) passing over the picking belt ran into quite a figure, as shown in the following table:

	<u>North End</u>	<u>Center</u>	<u>South End</u>
Sample	1	2	3
No. of stones (larger than 1")	109	87	93
No. of potatoes (marketable)	164	144	176
Weight of stones	59.25	64.50	48.0
Weight of potatoes	44.50	40.75	45.0
Per cent stones by weight	57%	61%	51%
Per cent potatoes by weight	43%	39%	49%
Per cent stones by number	40%	38%	35%
Per cent potatoes by number	60%	62%	65%

"For every ton of potatoes harvested, the machine, in addition, had to handle an average of 1.27 tons of stones over the picking belt -- or approximately eighty-six tons per day."

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** All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

Corn Yields from Contour vs. Up & Downhill - G. R. Free, Marcellus, New York.-"Up and downhill plots consistently yielded less than those on the contour. The average for contour was 84.8 bushels compared to 68.5 for up and downhill (yields calculated on the basis of Shelled corn at 15% moisture). Because of the maggot damage last spring, it was necessary to replant all corn at the Marcellus Station. Maturity was particularly important this fall. The moisture content of the contoured corn at harvest was about 8% less than the moisture content of the up and downhill planted corn. An even greater difference in maturity was noted in 1943 when a very early frost put an end to the growing season.

"These plots were started in 1942 on Honocyo soil on a 10% slope. They are only 100 feet long and have been in a good rotation. Erosion losses have at no time been spectacular, but a well-defined alluvial fan has been built up in the sod below the up and downhill plots. Mr. Bhagat, a graduate student in the Agronomy Department at Cornell working under Professor Zwerman, is taking soil samples this fall from these plots and areas below the plots for fertility and physical studies."

North Central States Regional Report on Soil Conservation Economics - H. O. Anderson, La Crosse, Wisconsin.-"Progress is being made on the Wisconsin section of the report on soil conservation economics which is being prepared by the Regional Farm Management committee of Land Grant Colleges in the north central states. Two meetings on this work were attended during October - one of the whole committee and one of the sub-committee which has the responsibility of writing the report. On the basis of the preliminary manuscript, the first named group recommended to the Directors of the Experiment Stations in these states that the report be published. The manuscript is being edited in light of suggestions received from representatives of each of the 13 states."

Soil and Water Loss under Winter Condition of Wheat Land in Relation to Tillage - Glenn M. Horner, Pullman, Washington.-"The tabulation of erosion loss data and straw applications from the stubble mulch plots was completed for the past winter and spring season. The results summarized on the following page are divided into two periods, January 19 to February 16, when the soil was frozen, and February 23 to March 23, when the soil was not frozen. These measurements were made on land seeded to wheat in the fall of 1949 following summer fallow operations. The initial tillage operations with a sweep resulted in a mulch cover where straw was returned to the soil, while the plowing operation covered all the straw and left the soil bare during the runoff season.

Treatment Initial tillage for fallow	Water losses (inches)			Soil losses (T/A)		
	Strew : Jan. 19- applied: Feb. 16*	Feb. 23- Mar. 23**	Total: Feb. 16* (T/A)	Jan. 19- Feb. 23- Mar. 23**	Feb. 23- Mar. 23**	Total
Sweep	2	2.48	.32	2.80	1.2	1.5
Sweep	1	3.08	.48	3.56	1.9	3.0
Sweep	0	2.79	1.72	4.51	4.1	10.1
Moldboard plow	2	2.06	1.92	3.98	5.5	11.5
Moldboard plow	1	1.96	1.52	3.48	4.2	9.9
Moldboard plow	0	2.45	2.45	4.90	4.9	18.1

* Soil was frozen during this period, with runoff caused by rain and melting snow.

** Soil was not frozen during this period, with runoff caused by rain (total precipitation: 5.31 inches)."

Soil Moisture in Relation to Chemical Fallow and Tillage - Torlief S. Aasheim, Havre, Montana.-"Soil moisture content of samples taken from stubble and fallow land in this project this fall were determined. The per cent of moisture found in the soil under the various fallow treatments is given in the following table:

Average per cent of soil moisture per foot to a depth of two feet in fallow land in the chemical fallow project at the North Montana Branch Station

Fallow	
<u>Fallow treatment</u>	<u>% soil moisture</u>
Subtilled	11.7
Fall sprayed & subtilled	11.5
Fall bladed & subtilled	14.1
Fall sprayed & sprayed	7.9
Sprayed	8.5
Idle	5.3

"These results indicate quite an advantage in favor of cultivated fallow over chemical fallow. This difference in favor of the cultivated fallow is to be expected because there was a considerable growth of volunteer wheat on the chemical fallow plots. Cultivated fallow plots on which the stubble was bladed after harvest contained more moisture than plots which were not fall bladed. Plots which were sprayed after the 1949 harvest contained no more moisture this fall than plots which were not sprayed."

Effects of Land-Resting and Conservation Rotations on Crop Yield -
O. R. Neal, New Brunswick, New Jersey. - "The conservation effectiveness of land-resting and sod rotations has been shown repeatedly. Soil and water losses from cultivated land are much lower when the cultivation follows a grass-legume sod or other non-cultivated crop, as compared with continuously cultivated areas.

"These soil management systems which reduce soil and water losses also increase acre yields of cultivated crops. Tomato and sweet corn yields under continuous cultivation and under a 3-year rotation including a grass-legume sod are shown in the following table.

Table 1. Crop yields under continuous cultivation and a sod rotation

Year	Continuous Cultivation		Sod Rotation	
	Tomatoes	Sweet Corn	Tomatoes	Sweet Corn
	T/A	No. 1 ears/A	T/A	No.1 ears/A
1946	9.2	8540	12.8	11680
1947	18.5	10660	25.4	13530
1948	11.9	4940	18.0	10710
1949	13.5	6470	14.3	8760
Average	13.2	7650	17.6	11190

"Each yield value shown is the average from four replicate plots. With identical fertilizer application on the two cropping systems, the sod rotation has produced 33% more tomatoes and 46% more sweet corn than was produced under continuous cultivation.

"Sweet corn yields for a 3-year period following different land-resting treatments are shown in Table 2.

Table 2.--Sweet corn yields following different land resting treatments

Treatment	Yield - No. 1 ears per acre	
	3 year average following treatment	4 year total
Continuous cultivation		
Rye winter cover (check)	6050	24920 (4 crops)
Rested 1946 - Ryegrass & vetch	9280	27840 (3 crops)
Rested 1946 - Clover, alfalfa, timothy sod	9290	27870 (3 crops)
Rested 1946 - Winter cover, soybeans, winter cover	10380	31140 (3 crops)
Rested 1946 - Winter cover, Broadcast corn, winter cover	8040	24120 (3 crops)

"In all cases except one the total production in three crops following treatment was greater than from four crops under continuous cultivation.

"Sweet potato yields following a land-resting treatment using broadcast field corn, totalled 606 bushels in 2 crops as compared with 569 bushels in 3 crops under continuous cultivation.

"In 1949 white potato yields from a 2-year rotation of potatoes and wheat with clover seeding averaged 352 bushels of No. 1's as compared with 270 bushels from continuously cultivated areas.

"Field trials of land-resting and crop rotation on privately owned farms in New Jersey have shown yield increases in varying amount over continuously cultivated areas for a variety of vegetable and general farm crops.

"All of the above yield data show the effects of conservation rotations alone without other supporting conservation practices. Under actual farm conditions the rotations would be combined with other necessary conservation practices. In this situation greater yield benefits would be expected. Furthermore, under good conservation practices these high yields could be permanently maintained. Without adequate conservation treatment where needed, present yield levels would be expected to decline as shown in the earlier report on yields from eroded areas."

Contour Cultivation of Soils Having Poor Internal Drainage - H. L. Borst, Wooster, Ohio.-"Thirteen contour vs. slope culture field trials in 6 districts were harvested. An effort was made this year to locate most of these trials on soils of poor internal drainage (so-called 2 and 3 profile soils) in order to get further information regarding the advisability of contouring these soils. Trials were also located on well drained soils of Clark and Wayne counties.

"In six of 9 trials on 2 and 3 profile soils yields were lower on the contoured plots than on the non-contoured. There is an indication that soil physical condition as indicated by rotation and cropping practices is related to contouring feasibility; the better the soil condition the less the yield reduction from contouring. In general the crop on the contoured areas was enough poorer than that on the non-contoured rows to be noticeable."

Wind Erosion in Relation to Wheat Row Direction and Surface Roughness - A. W. Zingg, Manhattan, Kansas.-"Studies of the effect of row direction on erodibility to wind were performed on the Agronomy Farm near Manhattan. For wheat, approximately 2-4 inches in height, the soil loss when the wind tunnel was oriented parallel to the row direction was approximately 2.7 times as great as the loss when the tunnel was operated perpendicular to the rows. The reduced soil loss appeared to be associated with the increased roughness encountered at right angles to the row direction. The respective roughness in terms of the ridge roughness equivalent was .76 and 1.76 inches respectively for resistance to air flow parallel and perpendicular to the row direction. The ratio of roughness was, therefore, $1.76/.76 = 2.3$ which is almost inversely proportional to the relative soil losses."

Runoff Plot Data Pertaining to the October Hurricane Rainstorm -
B. H. Hendrickson, Watkinsville, Ga. - "During 19 hours, from 5:00 a.m.-midnight October 19, rainfall totaled 5.11" - the second highest daily rainfall in the Station 14-year rainfall records. (The highest figure was 6.90" on August 12, 1940.)

"Intensities were moderate: for 5M - 2.16, 10M - 1.74, 15M - 1.44, 30M - 1.24 and 60M - .96 inches per hour rates.

"The expected recurrence of a similar rainstorm, based on a probability curve for October rainfall using 1885-1949 rainfall data for Athens and the Station at Watkinsville, developed according to Potter, indicated a storm equal to this October's 8.11" rainfall may be expected to recur once in 30 years. Similarly, we expect 2.7" of October rainfall once in 2 years, 5.9" in 5 years, 6.3" in 10 years, 7.8" in 25 years and 9.5" in 50 years.

"More soil was eroded from criterion plots in October 1950 than in any other October on record, still the quantity was relatively small. Not over 2.00 T/A was lost from any runoff plot. Continuous cotton plot losses were as follows:

		Runoff		Erosion
		In.	%	T/A
Class II	3% slope plots	1.90	25.7	1.26
Class III	7% slope plots	2.81	38.6	1.28
Class IV	11% slope plots	3.59	51.0	1.87

"It is interesting to compare the water lost as runoff on continuous cotton, representative of ordinary row-cropped land, with the water lost in conservation-treated land, and express the difference as 'savings' in favor of the latter, - if any. In these terms, on Class II land, in a 2-year rotation with oats-Kobe lespedeza, cotton in rotation effected an 83.7% saving, or reduction of water loss, and also an accompanying saving of an even 50% of soil loss.

"On Class III land, the corresponding comparison indicated reductions of 51.6% of the runoff and 82.8% of the soil loss.

"Also on Class III land, in a 3-year rotation of oats-Kobe, then volunteer Kobe, cotton in rotation saved 39.7% runoff and 48.4% of soil loss, and on Class IV land saved 46.5% and 60.4% of the soil loss.

"Incidentally, in these lespedeza rotations, first year Kobe lespedeza was maturing a seed crop at the time of the storm; second year lespedeza had recently been cut for hay leaving only stubble with virtually no canopy. It was noted that the stubble was much less effective in runoff control.

"In the above comparisons, reductions of runoff are of especial interest, because of large quantities concerned and of their effects in relation to flood control. Erosion loss differences were less significant, as they were relatively small in amount, and, as is well known, may then vary unaccountably."

"Flash flood-water runoff was virtually eliminated during this 8" rainstorm by the following runoff plot short-slope covers, as on terraced land as indicated by the following figures giving the percentage of rain that ran off:

	<u>% Runoff</u>
Sericea for hay on Class IV land, 11% slope	4.
1st year Kobe lespedeza on Class III land, 7% slope	1.6
"Other highly effective covers under measurement were:	
Vol. Kobe lespedeza hay stubble, Class III land, 7% slope	7.2
Kudzu, 2nd year recovery after corn, Class IV, 11% slope	7.8
Alfalfa (harvested for hay) Class III land, 8% slope	10.8

"By direct comparison, continuous cotton lost from 25.7 to 51.0% of the rainfall as runoff, - same soil, same slope, same rainstorm!"

Soil and Water Losses in Relation to Land Management Treatment -

O. E. Hays, LaCrosse, Wisconsin.-"Land planted to corn up and down hill on a three percent slope lost 8.9 tons of soil per acre this year. This is the highest soil loss measured in any year since measurements were started in 1947. Soil loss from grain was low - 0.5 tons per acre. Runoff was 2.7 inches from corn, 1.5 inches from grain. Strip cropping effectively reduced both runoff and soil loss. There are four strip cropped plots, two with corn and hay, two with grain and hay. The sequence of crops is arranged so that every position of crop is represented on the four plots. The corn-hay plots lost an average of 0.5" of runoff and 0.3 tons of soil; the grain-hay plots lost an average of 0.7" of runoff and 0.1 ton of soil. These plots are on the shallow, slowly permeable silt loam (Almena silt loam). The plots are 300 feet long and planted to a CGHH rotation.

"The runoff data indicate that this soil, even though poorly drained, does have a fairly high infiltration rate when dry. For example, on June 9 a rain of 1.55" with a 30-minute intensity of 1.52" per hour caused only 0.08" runoff. However, when the moisture content of the soil is high, the water intake is low. For example, the storm of June 12-13, with a total rainfall of 1.39" and a 30-minute intensity of 1.28" per hour, caused 0.4" of runoff - or 5 times as much as the June 9 storm, the main difference being antecedent soil moisture conditions.

"Terraces at 100 foot intervals with 6 inches fall per 100 feet, allowed more runoff from grain and hay than was measured from the same crops planted up and down hill. There was less runoff from corn on the terraces than from the up and down hill plots.

Runoff Summary

<u>Treatment</u>	<u>Corn</u>	<u>Grain</u>	<u>Hay</u>	<u>Average</u>
Up-and-down hill	2.7"	1.5"	0.5"	1.3"
Strip Cropped	0.5"	0.7"	-	0.6"
Terraced	2.2"	2.1"	0.7"	1.4"

Stubble Mulch Studies in Relation to Soil Moisture in October -
C. J. Whitfield, Amarillo, Texas.-"The stubble mulch plots were sampled to a depth of four feet for soil moisture on October 14. Considerable differences in available soil moisture were noted at that date, depending partly upon whether the oneway plow or sweep machine had been used for cultivation and partly on the amount of residue remaining. The largest gains in soil moisture since the previous sampling date, June 27, were made on the wheat on fallow plots which had a large amount of residue from the 1949 crop. Lesser gains were made on the continuous wheat plots which produced less residue in 1949, and the least on the fallow plots on which no appreciable amounts of wheat stubble residue remained from the light straw of the 1948 crop. No wheat was produced on any of the plots in 1950. Where little residue remains, the type of tillage seemed to make less difference in the amount of moisture saved. The amount of moisture retained in the soil ranged from 8 to 27 percent of the 14.32 inches of rainfall. Soil moisture was probably drawn upon heavily by annual weeds which grew on the plots during a wet period in July, when it was too wet to cultivate.

Inches of Available water in Top 4 Feet of Stubble mulch Plots on June 27 and October 14, 1950; and the Gain in Soil Moisture Between those Dates

Tillage	Available Moisture Inches		Gain in Soil Moisture June 27 to Oct. 14	
	June 27	Oct. 14	Inches	Percent/Rainfall
Continuous wheat				
Subtilled	3.32	5.06	1.74	12
Onewayed	1.94	3.32	1.38	10
Wheat on fallow				
Subtilled	2.39	5.25	2.86	20
Delayed subtilled	2.56	6.37	3.81	27
Onewayed	1.58	3.33	1.75	12
Fallow				
Subtilled	3.69	4.79	1.10	8
Delayed subtilled	4.03	4.70	0.67	5
Onewayed	3.43	4.74	1.29	9

Winter Wheat Yields in Relation to Tillage Practices - M. M. Oveson, Pendleton, Oregon.--"There was not a marked difference in the yields obtained from the main tillage plots on the Hill field. Table 1 shows the yield of Elgin wheat for the various tillage plots with the average yield and test weights also given.

Table 1.--Yield of Elgin winter wheat grown after various tillage practices on the Jim Hill pilot farm in 1950

Method of Cultivation	Yield bushels per acre			Ave.	Test weight
	Series 1	Series 2	Series 3		
One Way Disk	27.7	26.9	21.8	25.5	58.4
Off-Set Disk	26.4	25.3	22.7	24.8	59.1
Sweep	27.6	25.2	26.2	26.3	58.8
Sweep + 20 lbs. N. per acre	29.3	27.6	24.9	27.3	59.2
Stubby Moldboard	25.2	24.0	24.4	24.5	58.6
Moldboard Plow	27.6	28.0	23.7	26.4	58.8

"It is interesting to note that the plots prepared with the sweep were among the high yielding plots in 1950. Where 100 lbs. of ammonium sulfate was added at the time of initial tillage there was a slight increase in yield, but not of significant value to pay for the cost of the fertilizer used. Where the sweep was used without fertilizer, the yields were just the same as where summer fallow was prepared with the moldboard plow. In all cases, the summer fallow was rod weeded at least twice during the summer. Where the sweep and the stubby moldboard was used to make the initial tillage, the ground was covered three times with the rod weeder. Once after the first tillage and twice during the summer. Where the fallow was prepared with a moldboard plow the land was gone over soon after plowing with a spring tooth harrow, while in the case of the one-way disk and the off-set disk, the land was gone over twice with the rod weeder. All plots except the moldboard plowed plots was gone over with the Dunham Culti-Hoe just before seeding."

Mulch Balk Effective Erosion Control for Tobacco Land - T. L. Copley, Raleigh, N. C.--"Summer results showing runoff and erosion from our runoff plots planted to tobacco have been prepared by Luke A. Forrest, and are given in the table on the following page.

"During the 3-months period, June through August, runoff and soil loss was approximately the same following, winter covers turned early or at the normal turning stage as following no cover. Delayed turning of rye after it had headed and the straw had become tough reduced runoff slightly and reduced soil loss about 1/3 below that following earlier turned rye.

Runoff and Soil Loss From Rotation Plots for the Summer of 1950
(Average of 4 replicates)

	JUNE		JULY		AUGUST		TOTAL	
	Rainfall 5.28"		Rainfall 5.26"		Rainfall 2.20"		Rainfall 12.74"	
	Runoff % of rainfall	Soil Loss T/ac.	Runoff % of Rainfall	Soil Loss T/Ac.	Runoff % of Rainfall	Soil Loss T/Ac.	Runoff % of Rainfall	Soil Loss T/Ac.
No winter cover	17.42	1.054	8.56	.142	24.09	.156	14.91	1.352
Rye grass turned early	15.91	.978	9.89	.173	27.27	.197	15.38	1.348
Rye turned early	16.67	.932	8.75	.146	27.27	.181	15.23	1.259
Rye turned late	15.34	.633	7.79	.108	18.18	.104	12.72	.845
Rye-vetch turned late	18.37	1.053	11.03	.175	20.00	.115	15.62	1.343
Balk Mulch (Rye)	2.27	.089	.19	.003	3.18	.022	1.57	.114

"The Mulch balk reduced both runoff and soil loss to only 10 percent of the check or early-turned covers. Similar results were obtained in 1949 -- the first year of this experiment. Other than controlled row grade and good row layout this is the only practice that has ever given really effective erosion control on bright tobacco land. In this mulch balk method the winter cover was turned and the rows prepared along the row area, leaving the winter cover to continue growing and the balk left in the row middle. This balk was thrown out at the last cultivation and the straw residue scattered along the row middle.

"This experiment is to be continued as outlined, but in addition we hope to try the mulch balk method on more of a field basis, using an acre or so somewhere else on the station farm. If it continues effective and can be handled on a practical basis we should soon begin trials on a few tobacco farms of this Piedmont area, especially in the Old Belt."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio. - "Rainfall of 1.43 inches for the month was well below normal. Intensities were low and surface runoff negligible.

"Average corn yields for the three mulch and three plowed plots (no 2,4-D) this year are given below:

Treatment	Yield per acre (bushels)	Stand per acre (number)
Plowed	77.0	10,280
Disked	76.7	10,260

"Average corn yields for the three mulch and three plowed plots (2,4-D pre-emergence) plus two cultivations for this year are given below:

Treatment	Yield per acre (bushels)	Stand per acre (number)
Plowed	62.8	8,320
Disked	57.5	9,960

"It is apparent that where no 2,4-D treatment was applied for weed control that the corn yield on the mulch (disked) areas was practically the same as that on the plowed areas. The 2,4-D applications had a detrimental effect on both the plowed and disked areas, but noticeably more on the latter.

"Mulch for cornland was obtained on a field strip by applying 6 to 8 tons of manure when the corn was 2 inches high. This gave good protection to the soil surface during the critical erosion season. It offered no handicap to cultivation and there was no increase in the weed population. Yields follow:

Treatment	Yield per acre (bushels)	Stand per acre (number)
No manure top dressing	88.4	10,000
Manure mulch	88.2	10,000

"Still another way of mulching cornland was tried--that of applying spoiled hay (first cutting) on a field strip. This was applied by hand after the last cultivation. Soil moisture remained higher under this mulch throughout the critical dry season than in the unmulched area. In the latter area the moisture content approached close to the wilting point. A timely rain prevented crop failure where there was no mulch. Yields follow:

Treatment	Yield per acre (bushels)	Stand per acre (number)
Unmulched	98.4	15,500
Mulched	99.2	15,500
Mulched	110.4	15,500

"Of course this method requires hand labor. It is, however, a good way to dispose of spoiled hay and it is on the land when moisture conservation is most important for crop growth.

"Another way of obtaining a mulch on cornland was to throw the plow furrow over only part way--that is, stand it on edge. The mulch was obtained by pulling up some of the sod with a field cultivator (mounted spring-tooth harrow) operating 4 to 5 inches deep. It appeared that there was not enough mulch to prevent sealing, erosion, and water losses to a great extent. The mulch area was planted at a higher rate. Extremes in the plot yields follow:

Treatment	Yield per acre (bushels)	Stand per acre (number)
No mulch*	83.4	10,000
Mulch	95.9	12,500

*Normal plowing, fitting, and seeding operations.

"In former years, the final stand count on the mulch (disked) areas has been lower than that on the plowed areas--although the planting rates were the same. This year the planting rate on the mulch (disked) areas was increased. Also weight was added to the planter to obtain greater compaction. This resulted in more comparable stands and in some cases more favorable stands on the mulch areas.

"The trend in corn yields on the conservation watershed is striking. Rotation of corn, wheat, and 2 years meadow.

Year	Yield		May - September			
	Bu. per acre		Runoff (inches)		Erosion tons per acre	
	No. 103 ¹	No. 110 ²	No. 103	No. 110	No. 103	No. 110
1942 ³	47	58	1.08	1.20	5.0	21.4
1946	59	52	2.21	2.83	4.1	18.7
1950	86	62	4.31	7.70	6.7	29.4

¹Watershed 103 began conservation practices (contour, liming, alfalfa, etc.) with corn year 1942.

²Watershed 110 remained in straight rows (across the slope) and without alfalfa meadows.

³Land improvement began in 1942 with contouring on watershed No. 103."

Hydrologic Studies - R. W. Baird, Blacklands Experimental Watershed, Waco, Texas.--"During the month of October rainfall totaled 0.92 inch as compared with the normal of 2.59 inches. Rainfall to date for 1950 has totaled only 20.38 inches as compared to the normal of 29.54 inches. In spite of the low rainfall, this has been a favorable year as far as crop production is concerned, and above normal yields of cotton and corn have been obtained. The yield of oats was somewhat below normal due to the extremely dry weather of March and early April. The dry weather of October has enabled us to complete the harvesting of all crops and to prepare land for the 1951 crops. All the fall planted small grain and legume crops have been planted, and a good stand of small grain obtained on most areas. Additional rain will probably be needed before a satisfactory stand of the clovers is obtained. There has been no runoff of appreciable magnitude since February

1950. The soil now is quite dry, and considerable rain will be required before any runoff should be anticipated.

"Cotton yield figures for the year 1950 have been completed, and again the conservation practices have shown a marked increase in yield as compared with the ordinary farm practices in this area. Table 1 shows the cotton yields for various

Table 1.--Cotton yields - 1950

Gov't. operated land conservation practices	Yield		Acres	% Dead Cotton Aug. 1
	#	Lint Cotton per acre		
Cotton-Hubam Rotation		448	7.9	6.8
Oats and Hubam-Cotton-Corn Rotation		382	15.9	3.5
Oats and Madrid-Cotton-Corn Rotation		300	6.4	22.3
Oats and Hubam-Corn and Peas-Cotton Rotation		170	2.9	59.9
Ordinary practices Cotton-Corn-Cotton-Oats Rotation	Yield		Acres	% Dead Cotton Aug. 1
	#	Lint Cotton per acre		
Gov't. operated		180	5.6	24.0
Farm Unit 1		133	4.4	*
Farm Unit 4		166	20.8	29.3
Farm Unit 5		143	35.0	31.7
Farm Unit 7		144	20.1	15.0
Farm Unit 8		160	22.6	43.4
Farm Unit 9		188	25.4	23.1

*No record.

treatments and for ordinary practices under different farm operators. Using farm practices ordinarily following in this area, the land operated by the Project with hired labor had yields comparable with those obtained by the tenants--180# compared to an average of 159# for tenant operators. The rotations where cotton follows Hubam clover had yields of 382# and 448# lint cotton per acre. This is more than twice the yield obtained under ordinary farm practices. Also, the amount of root rot, as indicated by the amount of dead cotton August 1, has been greatly reduced. We have consistently had high percentages of root rot and low yield of cotton where cotton followed winter peas, and this has been true again this year. We are continuing this practice for at least one more year to check previous results. In areas where cotton root rot is a serious problem it appears that the Madrid clover is less effective than Hubam clover in control of root rot. The yield from the area following a crop of Madrid clover was quite good, however--300# lint cotton per acre. Use of Madrid clover in a rotation will be continued for several years to see if this is a chance occurrence or if the greater amount of root rot can be expected regularly following Madrid clover. The increase in yield with conservation practices this year is somewhat greater than during previous years. This may be due to climatic variations but is quite possibly affected by the cumulative effects of good land use practices. With the increase shown for the last several years we should have information which will enable us to show farmers in this area the financial benefits of reducing the percentage of cotton grown and still be able to maintain the actual pounds of cotton produced."

Hydrologic Studies - Lewis H. Stolzy, East Lansing, Michigan. "Precipitation for the month of October, as measured by the U. S. Weather Bureau type of standard non-recording rain gages, amounted to 1.62 inches at the cultivated watersheds, 1.69 inches at the wooded watershed, and 1.71 inches at the stubble-mulch plots. These amounts are approximately 66 percent, 68 percent, and 69 percent, respectively, of the 50-year average October precipitation of 2.47 inches. October precipitation can be expected to equal or exceed 1.62 inches once 1.42 years.

"On October 16 Mr. Joel E. Fletcher, Station Supervisor, Tucson, Ariz., arrived at East Lansing following Dr. Nichols' instructions. On Monday afternoon, Mr. Crabb acquainted Mr. Fletcher with some of the Station's methods of data gathering and their analysis. On Tuesday Mr. Crabb, Mr. Fletcher, and Mr. Stolzy made an inspection of the hydrologic installations on the Station. Mr. Fletcher seemed impressed with our work here and took several charts and data back with him for use in his work. The Acting Station Supervisor feels this visit by Mr. Fletcher developed a closer relationship, thereby enabling us to call upon him for consultation.

"On October 23 Mr. Crabb attended the meeting in connection with the Rifle River Watershed Development arranged by the Michigan Department of Conservation. The various agencies represented at this meeting were the U. S. Weather Bureau, the State Forestry Service, Geologic Survey, Geology Division, Game Division of the Conservation Department, Water Resources Commission, and Soil Conservation Service. The purpose of this meeting was to discuss the research program of the Rifle River Watershed Development and to try to determine what research work was necessary to contribute to stream improvement programs. The Fish Division complimented the Soil Conservation Service on their cooperation and help in this area. The Hydrologic Research Station was requested to furnish 12 rain gages on a loan basis as well as the possible loan of a silt sampler. The State Conservation Service is trying to coordinate all the branches in an attempt to improve stream conditions throughout Michigan. At the present time the main purpose of the Rifle River Watershed Development is to improve stream conditions for aquatic life. We feel our participation in this program will be of value to the Service.

"At the close of business October 26 Mr. Crabb, Station Supervisor, left on military furlough to the U. S. Navy."

Hydrologic Studies - T. W. Edminster, Blacksburg, Virginia. "Mr. Holtan met with the Flood Control group at Staunton discussing procedures for applying the infiltration and hydraulics of flow method of estimating runoff to be expected in that area. Some initial measurements of channels in the Bell Creek watershed were taken in an effort to find a readily obtainable field criterion of hydraulics of flow. It is hoped that channel measurements will permit the calculation of the detention discharge relationship of the watershed. This idea will be checked on several watersheds where runoff records are available, before being applied to watersheds generally.

"While in Staunton, both Mr. Holtan and the Project Supervisor inspected the Bell Creek installations and left instructions with the Flood Control personnel the method to use in closing out the equipment for the winter season.

"While returning from Staunton, the Project Supervisor and Mr. Holtan met Mr. Melville Pittinger, Work Unit Technician, and went over in detail the flood areas of the Rockbridge County flood that occurred on September 9 and 10. Mr. Holtan made detailed notes on the flooding characteristics as affected by changes in channel grade. These data will be used in conjunction with the Staunton data in furthering

the development of a method of estimating runoff for areas having steep headwaters breaking into more level lower areas."

Hydrologic Studies - John A. Allis, Hastings, Nebraska. - "In March 1950 we seeded Partridge Pea, Annual and Biennial Sweet Clover on our seven 4-acre wheat watersheds so as to include a legume in our 3-year rotation of corn, oats, and wheat. The growth of legumes on all these watersheds was very satisfactory and the land is being enriched with nitrogen, which is lacking in the soil. After an inspection of the watersheds in October 1950, we decided to combine the Partridge Pea on the spots that were the heaviest, which would leave sufficient seed for a volunteer growth next spring since many of the pods had already shattered. On approximately 6 acres we combined 240 pounds of Partridge Pea. At the current price of \$.40 per pound we harvested sufficient seed to pay for the total cost of including a legume in the rotation on all the watersheds. The additional yields we hope to make in our corn next year by having a legume in the rotation will be all profit.

"Arrangements had been made for the use of a road patrol from the SCS Nursery in early September to build terraces on watershed W-5. The delay in receiving this equipment prevented us in building terraces on the remaining land under cooperative agreement, which had been seeded to wheat. In October we received the patrol and 7,580 feet of broad-base terraces were built, which completes 65 percent of all terraces planned on watershed W-5 against 55 percent previously built. The SCS Nursery is commended for their cooperation in loaning us this equipment. SCS Operations continued to stake out the terraces and help all they could in our effort to place this watershed under conservation practices. The 4-inch rain on September 19-20 did considerable damage to the waterways in this area. During October we spent about 10 days with the Ford tractor and scoop filling in gullies.

"In October we received 1.25 inches of rain which fell in two storms on October 1 and 2. The intensities were low and produced little runoff. The approximately 4.5° above average temperatures with no freezing weather benefited the fall wheat, which looks especially good.

"Corn samples from the small watersheds under different land use practices continue to favor contouring and subsurface tillage as indicated in the following table:"

Table 1.--1950 average yield in bushels per acre from 4-acre watersheds under different land use practices

Corn Straight Row	26.6	bu. per acre
Corn Contoured	31.4	" " "
Corn Subtilled	33.8	" " "

Runoff Studies - Neal E. Minshall, Madison, Wisconsin. - "Precipitation at Colby for October was 1.33 inches. Most of this occurred on October 7 at low intensities with only a small amount of surface runoff.

"Precipitation at Fennimore for the month was 0.39 inch with no surface runoff.

"Precipitation at Edwardsville for the month was 1.40 inches, most of which occurred during the first week. There was no surface runoff since the precipitation from July 1 has been below normal.

"The period of October 5 and 6 was spent at Champaign going over the University of Illinois hydrologic set-up and servicing the instruments at that location. On October 19 and 20 I went to St. Paul to discuss hydrologic characteristics of a number of the different types of structures with Mr. Blaisdell."

Hydraulic Studies - Fred W. Blaisdell, Minneapolis, Minnesota.-"Mr. Donnelly spent most of the month checking the computations made on the rating curve data for the box-inlet drop spillway. He completed these computations late in the month and Mr. Blaisdell began to analyze the results. Late in the month Mr. Donnelly began a short group of tests to fill in some gaps in the calibration data."

"The analysis of the pipe drop-inlet spillway data was continued as time permitted until it became possible to concentrate on the box-inlet drop spillway work. As a result the pipe drop-inlet spillway analyses have been suspended for the present."

"October seems to have been a month for visitors at this project and they consumed a considerable amount of the time during the month."

On October 2, Mr. Shiro Sakurai spent the entire day at the project. He showed considerable interest in the structural work we are carrying out. Mr. Sakurai is Chief of the Construction Department of the Agricultural Land Bureau in Japan.

"A French engineering mission spent October 6 at the project. This mission was comprised of Mr. C. Tardits, Interpreter, Mr. Francis Adolphe Ciolina, Chief of Rural Engineering and Director of the Development Plan in Madagascar, Mr. Jean A. L. R. Kellerman, Chief of Rural Engineering in Equatorial Africa, and Mr. Louis A. Minjoz, Deputy Chief of Rural Engineering in French West Africa. Since these men spoke little English, arrangements were made with Dr. Straub to borrow Mr. Thomas Timar from the St. Anthony Falls Hydraulic Laboratory staff as Mr. Timar speaks French fluently."

"Also on October 6, Professor Maurice Albertson of Colorado A&M College visited with us and contributed considerable information that will be of value to us in conducting our cantilever-outlet studies."

"On Monday, October 9, Mr. Howard T. Critchlow, Director and Chief Engineer of the State Division of Water Policy and Supply, Trenton, N. J., spent some time with us and we were able to contribute some information which he can use to good advantage in his work."

"Mr. Wesley McCann, Head Regional Account Section, made a fiscal inspection of the project on October 11."

Mr. Herrin F. Culver, Head Visual Information Section, SCS, and Mr. Ryerson also visited the project on October 11. Mr. Culver was particularly interested in the possibility of using some of our laboratory work in a film which he is planning on irrigation."

"Mr. Neal Minshall, Project Supervisor at Madison, Wis., spent October 19 at the laboratory. Mr. Minshall was particularly interested in discussing some problems he is having in measuring the discharge from his hydrological watersheds."

Hydraulic Studies - Donald A. Parsons, Minneapolis, Minn.-"Four more series of tests were made of a Coshocton-type runoff sampler of 2-foot diameter. The purposes of these tests were: (1) to try out a sampling slot of new shape, which is expected will provide a more uniform sample of that part of the flow near the bed of the approach flume; and (2) to try out modifications in the driving vanes of the wheel in an attempt to reduce the range in the proportion of the flow caught by the sampler at the various discharges.

"With the aid of Dr. Middleton, a complete duplication of one series was made to show the order of reproducibility of the test results. Also, several observations at several flows and with two different methods of slot construction were made of the ability of the device to pass trash. The observations were encouraging; however, laboratory trials can be no more than qualitative in this respect. A few tests were made that showed the considerable effect on sampler catch by beveling the edges of the slot."

Hydraulic Studies - Wm. O. Ree, Stillwater, Oklahoma.-"During October the following tests were run:

Channel or structure	Lining	Expt. No.	No. of tests	Range of Discharge
FC 25	Bermuda and concrete	1	6	10-125 c.f.s.
FC 8	King Ranch Bluestem	1	1	6 - 30 cfs

"In addition to these experiments tests were made to calibrate a pitot tube. Both rotating tank and towing tests were used in this calibration.

"The experiment on channel FC 25 was one of the most interesting performed in some time. The channel is different in that it has a small concrete gutter down the center line. It is a so-called trickle channel. The channel was designed to convey 150 c.f.s. However, testing was halted when a discharge of 125 c.f.s. was reached. Erosion had started to take place along the gutter edges. Where the erosion was most severe the cover was poor, consisting mainly of crab grass instead of Bermuda grass. The velocity was high in the section reaching approximately 25 feet per second. It may be difficult to hold the gutter edges with grass alone. This will be tried next year using a dense Bermuda grass sod along the edges.

"The King Ranch Bluestem in channel FC8 is a little over 2 years old. The stand is rather poor because of lack of fertility. During the tests excessive scour started to take place on the bare areas between the clumps. The channel was designed for 150 c.f.s., but testing was halted at 30 c.f.s. Efforts will now be made to improve the stand. Possibly a better stand will permit higher flows."

Supplemental Irrigation Studies - John R. Carreker, Athens, Georgia.-

"William B. Land reports that the total rainfall of 8.07 inches in October was recorded as follows: October 8 - 0.51 inch, 19 - 4.80 inches, 20 - 1.34 inches, 21 - 0.35 inch, 22 - 0.31 inch, 23 - 0.03 inch, 24 - 0.73 inch. This monthly total of 8.07 inches was 5.16 inches more than the long-time average of 2.91 inches. The soil was very dry before the rain began on the 19th. All the rains were low in intensity causing the soil to be thoroughly wetted during the October 19-24 period.

"Daily temperature reached the minimum of 33 on October 13 and the maximum of 87 on October 15. The range of maximum and minimum temperatures during the month were 66 to 87 and 33 to 58 respectively.

"Daily evaporation measurements totaled 3.71 inches. The total wind movement measured 931.3 miles.

"The crimson clover and rye grass and the fescue grass areas of the supplemental pastures were irrigated 1.0 inch on October 5. Vegetative samples of the crimson clover and rye grass area showed green weight yields on October 27 of:

Irrigated	- 5.42 tons per acre
Unirrigated	1.96 " " "
Increase	3.46 " " "
	180 percent

"The sweet potato harvest was completed on October 5. Yields by plots are given in tables 1 and 2. The furrow irrigated plots received irrigations of 1.0 inch on July 7 and August 25. Yields from the potatoes on the furrow irrigated plots averaged 252.7 bushels per acre and those from the check plots averaged 271.1 bushels per acre, for a decrease of 18.4 bushels per acre, or 6.8 percent with irrigation. Yields on the sprinkler irrigated plots averaged 232.20 bushels per acre while on the check plots the yield averaged 255.45 bushels per acre. The decrease was 23.25 bushels per acre, or 9.1 percent with sprinkler irrigation.

Table 1.--Yield of sweet potatoes by plots with and without furrow irrigation in 1950

Unirrigated		Irrigated	
Plot No.	bu/ac	Plot No.	bu/ac
1	284.60	2	235.60
4	233.40	3	275.20
6	247.40	5	283.20
8	319.20	7	219.60
Average	271.15	Average	252.72
		Decrease	18.43
		Equals	6.8 percent

Table 2.--Yield of sweet potatoes by plots with and without sprinkler irrigation in 1950

Unirrigated		Irrigated	
Plot No.	bu/ac	Plot No.	bu/ac
1	284.6	9	225.5
4	233.4	10	275.1
6	247.4	11	256.3
8	319.2	12	240.8
13	222.8	15	199.9
14	225.3	16	195.6
Average	255.5	Average	232.2
		Decrease	23.3
		Equals	9.1 percent

"Records from operating our irrigation equipment were obtained under actual field conditions comparing the use of trained labor and untrained labor in pastures during the first half of the month on the Southern Piedmont Conservation Experiment

station and on the privately owned farm of M. C. Southwell near Athens.

"On the S. P. C. E. S. water was applied to 4.85 acres of oats, crimson clover, and Ryegrass. The trained project laborers were used. The operating conditions and results were as follows: Main line along edge of field, one lateral line for sprinklers at end of main, 10 to 12 sprinklers on lateral, first lateral set-up 20 feet of elevation above the pump, last lateral set-up 40 feet of elevation above the pump; discharge rate of 140 to 180 gallons per minute, pump pressure was 50 to 65 p. s. i. depending on elevation and length of main and lateral, runs were 150 to 166 minutes, the average nozzle pressure was 40 p. s. i; average time for 3 men to move lateral and start pump was 50 man-minutes for each run, total operating time required to apply 7.29 acre-inches or 4.85 acres was 27 hours 52 minutes; gasoline consumption was 40 gallons, or 5.48 gallons per acre-inch.

"The set-up was similar to this on Mr. Southwell's farm. The length of lateral line and the number of sprinklers were the same as for the previous study. Inexperienced, ordinary farm laborers, were used and the average time for moving the lateral was 93 man-minutes for each run.

"Professor Carlisle Cobb, Jr., of the Agricultural Engineering Division spent nearly the entire month of August measuring the quantities of roots at different depths under corn, cotton, and Ky 31 fescue grass. Professor Joel Giddens of the College of Agriculture Soil Testing Laboratory determined the plant nutrient contents of some of these soil horizons. Results from these measurements are given in tables 3, 4, and 5.

Table 3.--Quantity of Ky 31 fescue roots at various depths in Cecil soil

Soil depth in.	Roots T/ac	Acidity ph	Soil chemical analysis*				
			NO ₃	P ₂ O ₅	K ₂ O	CaO	MgO
0-6	3.23	6.2	T	H	M	L	L
6-12	.31	5.9	T	L	L	L	L
12-18	.40	5.5	T	T	L	M	L
18-29	.29	5.6	T	L	L	L	M

*T equals trace; L equals low; M equals medium; H equals high

Table 4.--Quantity of cotton roots at various depths in Cecil soil

Soil depth in.	Roots T/ac	Acidity ph	Soil chemical analysis*				
			NO ₃	P ₂ O ₅	K ₂ O	CaO	MgO
0-6	0.17	6.0	L	M	M	L	L
6-12	.04	6.2	L	L	M	L	L
12-18	.03	5.7	L	L	M	L	L
18-24	.02	5.7	L	L	L	M	M

*L equals low; M equals medium.

Table 5.--Quantity of corn roots at different depths on unirrigated upland Cecil soil, and on unirrigated and irrigated lowland Congaree soil

Soil depth Inches	Quantity of corn roots on		
	unirrigated upland T/ac	unirrigated lowland T/ac	Irrigated lowland T/ac
0-4	0.235	0.379	0.559
4-8	.261	.060	.086
8-12	.067	.025	.028
12-16	.031	.022	.024
16-20	.027	.010	.023
20-24	.031	.017	.026
24-28	.019	.013	.023

"Soil moisture varied considerably during the period these various samples were taken. In all cases a few large primary roots penetrated below the maximum depths shown. These were following old channels or clearance lines in the tight clay sub-soil. In no case was a sufficient number of samples taken for conclusive results. The data in tables, 3, 4, and 5 are indicative, however, of the root distribution in these soils in late summer."

Supplemental Irrigation in Virginia Agricultural Production - T. W. Edminster, Blacksburg, Virginia.--"The total rainfall for the month was 0.85 inch. The pasture system was operated from October 3-12 using the electric unit as the gasoline engine failed to operate properly under load. One-half of the two irrigated lots was covered with an application of 1.5 inches before constant high wind velocities greatly interfered with the coverage pattern. No difference in the growth of the herbage can be seen where the application of water was made."

Drainage Studies - M. H. Gallatin, Homestead, Florida.--"Rains occurred on 23 days during this period with rains of over 1 inch recorded on 12 days, rains of over 2 inches on 5 days, and rains of over 3 inches recorded on 1 day. Rainfall was heaviest along the coastal marl area and along the northern portion of the area. In general the heavy rains were concentrated during the period 10-1 to 10-12 and 10-14 to 10-19. From 10-19 to 10-31 only a few very light scattered showers occurred. The average of all our gages was 10.57 inches, this is about average for October in this area.

"For the area as a whole there has been a slight increase in the water table. The greatest increase was recorded in the central and northern portion.

"Readings for the Redland profile for the period 10/2 to 10/16 showed gains of 0.67 to 2.08 feet. For the period, total gains were much less, ranging from 0.10 at the Highlands Water Control plot to 0.90 at well #12 at the north end of Redland Road.

"Readings from the Eureka Profile for the period 10/2 to 10/16 showed gains from 1.76 feet at the western end to 2.7 feet at well #23 about 1-1/2 miles west of Peters, Fla. For the period 10/2 to 10/31 gains ranged from 0.75 foot at well #14 to 2.29 feet at well #25 at the eastern end of the Profile.

"For the Mowry Street Profile for the period 10/2 to 10/16 gains of 1.26 feet at well #26 at the western end to 2.6 feet at well #31 were recorded. For the period

10-2 to 10/31 the gain ranged from 0.37 at Well #26 to 0.33 at Well #32 at the east end of the line.

"Readings on the Everglades Profile show that there has been a gain in the water table ranging from 0.59 to 0.74 foot with a very slight movement of the water northward at the measuring point and also at Bird Road.

Well location	10/3/50	11/7/50	Gain or Loss
Trail and Krome Ave.	6.12	6.86	Gain 0.74
Bird Road	6.15	6.85	" .70
Staff	6.22	6.86	" .64
G-25	6.27	6.86	" .59
G-24	6.23	6.84	" .61
G-23	6.02	6.75	" .73

"Readings at Well #5 at the corner of Mowry and Redland road show that the water table is a little lower than it has been for the past 5 years. On October 31, 1950, the water table was 4.54 feet MSL, on October 31, 1949, 5.59 feet MSL, on October 31, 1948, 4.72 feet MSL, on October 31, 1947, 5.34 feet MSL, and on October 31, 1946, it was 4.76 feet MSL.

"Samples collected from the Homestead area directly following the high tides which were caused by the Hurricane passing to the east of this area showed that there was a marked decrease in the concentration of chlorides. It was thought that the high tides might have contaminated some of the coastal marl area, as tides of 4 feet MSL were recorded.

"Apparently the fact that fresh water covered most of the area at the time and that immediately following the passage of the storm northward the wind blew from the west-south-west with a velocity of 25 - 35 miles per hour and pushed back the waters carried in by the tides.

"Sampling of an 80-acre field lying adjacent to the coast and protected by low dikes showed that the concentration has been lowered markedly over what it was last period."

Drainage Studies - I. L. Saveson, Baton Rouge, Louisiana. - "The months of August, September, and October have been very dry for this section of the country and the rainfall has been practically nil which has been good for the work. Grading work has been completed on the St. Delphine #3 test area which consists of 46 acres. The procedure used in grading this particular test area was to use the large land leveler, going crosswise of the cuts. In this operation the machine jumped the ditches, dropping the leveler blades in the ditch and pulling the earth to the center. Then on the return trip, catch the opposite bank and pull it to the center. After this crosswise operation, the scraper was used to move the earth from the high head lands and fill in the depressions. The third step was to cut the ditches and the fourth step was to move the spoil to the center of the cuts with the scraper, and last, use the land leveler lengthwise of the cut to smooth the area and fill the pockets.

"The following is a break down of equipment operation:

2 hrs. per acre of land leveler crosswise
1 hr. per acre to fill the holes
1/2 hr. per acre spreading earth from ditches
1 hr. for smoothing cuts lengthwise
Total operation 4-1/2 hrs. per acre

"The plantation started grinding on October 19. The dry weather has increased the sucrose content considerably and the cane is rather short but is exceptionally heavy. One of our test areas has been harvested. This is 47 acres on the West-over Plantation and is second year stubble cane (third year in cane). This area averaged 31.51 field tons of cane per acre and 41.90 standard tons of cane. The check area averaged 28.31 field tons and 35.93 standard tons per acre. It might be interesting to know the 3 years performance of this particular area was as follows:

Year	Standard tons	Check	Increase
1948	52.91	47.62	5.29
1949	38.75	32.08	6.67
1950	41.90	35.97	5.93
	133.56	115.67	17.89

"The increase of 17.89 tons per year at \$7.00 per ton, which is a conservative basis since cane will probably be high this year, is an increase of \$125.23 per acre. A similar detail report along with other test areas to be harvested will be included in our annual report.

"Work was started on October 30 to experiment with the feasibility of grading land for pastures. A test area was started on the Cinclare Plantation using a method similar to that one used on St. Delphine."

Drainage Studies - Ellis G. Diseker, Raleigh, North Carolina.-"After experiments with different chemicals and mixtures which have previously been reported it was found that 3 ounces of Essotone 44, per 4 gallons of water would satisfactorily control the burr reed, pennywort, and pease loose strife, in the McRae Canal. As a result of this finding the remainder of the 7,700 foot lenth of the canal has been sprayed within the past month with the above mixture. All the tops of the plants above water surface are dead and plant roots examined thus far are dead. Only light showers of rain have fallen since the spray was applied, and each occurred several days after applying the spray.

"A proposed joint experiment has been discussed by members of the Agricultural Engineering Department, the North Carolina Agricultural Experiment Station, the Research Division of Soil Conservation Service, the Bureau of Plant Industry, and the Operations Division of Soil Conservation Service. The experiment is a combined drainage, soil, and plant growth study, to determine the following:

- (1) Evaluate the soil and other factors affecting drainage.
- (2) Evaluate the effects of various soil management and drainage practices on soil properties and/or plant growth.

"These objectives were set forth in the original work plan. Tile spacing will be 160 feet apart with depths of 2, 3, and 4 feet. The cropping systems will be about as follows:

Treatment	Year 1	Year 2	Year 3	Percent of time in clean cultivation. (approximate)
1	Corn	Corn	Corn	100
2	Corn*	Corn*	Corn*	75
3	Corn	Sod**	Corn	38
4	Corn	Sod**	Sod**	25
5	Sod**	Sod**	Sod**	0

*Crimson Clover winter cover.

**Ladino, Fescue, Huban, Sericea Lespedeza, Alfalfa, Sweet Clover, Trefoil, and others.

"Soil studies will consist of permeabilities, perosity, aggregate analysis, etc."

Drainage Studies - Charles B. Gay, Fleming, Georgia.-"October has been a very busy month for us in that we have not only accomplished a great deal of field work, but have also tentatively completed a number of our plants for the program we are to follow. We are now in the process of changing our activities from clearing and developing land to the establishment of the research work.

"H. G. Ukkelberg's main activities for the month were as follows:

1. Supervised the field work during which time the stump holes were filled on about 10 acres and the land was disked twice.
2. Cleared about 2,300 feet of ditch right-of-way.
3. Removed roots, small stumps and brush from about 20 acres.
4. Prepared a 4-acre building site for fall planting.
5. Constructed a vat for creosoting fence posts and sawed approximately 1,500 posts to a uniform length with a slanting top.

"John Thorton, aided by Joe Daniels, blasted 1,300 feet of ditch with dynamite through low areas to remove surface water. Laid out 25 three-acre plots on the map of farm. Surveyed and supervised construct^{ion} 1,000 feet of farm road which was dug by dragline with ditches on each side. Surveyed and plotted profile of a 4,500 foot main canal which will serve as an outlet for the 180-acre tract."

Drainage Studies - T. W. Edminster, Blacksburg, Virginia.-"During the first week of October the Project Supervisor was called to Eastern Virginia to take pictures of a tile-laying operation in quick sand. A number of pictures were taken that can be used in the publication of the USDA bulletin on drainage under sand.

"A major portion of the Project Supervisor's time was spent in developing material for this quick-sand bulletin. Considerable work has been completed on the preparation of an initial paper on the subject for publication by the ASAE.

"Mr. Turner, Soil Scientist, reports that permeability sites through VA-268 have been completed and the data sheets are now being computed. A large portion of his time during October was devoted to further study of the problem of utilizing and stabilizing the fly ash from the Virginian Railway Power Plant at Narrows, Va.

"Mr. Walker presents the following report on analytical work that he has been carrying out during the past month:

"A discussion was given in last month's report which outlined the procedure being used for analyzing the data collected at the two main pump draw-down investigations in Virginia. It was noted that the general layout of the project seemed to lend itself best to be used in a modified form of the Darcy equation. Attention was called to the several difficulties encountered when applying present data to the equations. More specifically, the necessity of determining the effect of pumping (artificial subsurface drainage) upon water-table patterns was stressed. And finally, a curve was presented which showed what was believed to be the maximum effect of pumping for the conditions on the Lee farm.

"Since no definite method for checking the accuracy of this curve was known, it seemed wise to compare it with results from the Presson farm. From 199 water table draw-down curves developed, 40 were selected as those curves giving the most characteristic picture of water movement in the soil profile. These curves were compared with 19 curves representing the position of the water table when not affected by pumping (static water table). The point where a draw-down curve became tangent to a static water-table curve was considered to represent the maximum effect of pumping upon that soil water table. Frequently the position of the draw-down curve was not of the same elevation as the static water-table curve and, therefore, the curves did not intersect. In this case, the 'maximum effect of pumping' was taken to be the point where the draw-down curve became parallel to the static water-table curve. In a number of instances, there was no similarity between the pattern of the draw-down curve and that of the static water-table curve. It was not possible to locate the effect of pumping when these conditions existed.

"Two curves are presented on a sheet accompanying T. W. Edminster's report, copies of which can be obtained from the project. They represent the maximum effect of pumping for the investigations on the Lee farm and the Presson farm, respectively. The curve for the Lee farm was developed from the data submitted last month while the curve for the Presson farm was developed from data analyzed this month. The point of pump intake into the well (top of well liner) was used as the 'common point' for 'matching the curves.'

"The name of the farm on which the data was collected was used to designate these curves rather than use the respective soil types. It was believed that these curves represent the respective resultants of all factors (both natural and artificial) which affect water tables at each location; hence, the curves should not be associated with the soil type without reservations.

"Yet the curves mean nothing without considering the soil conditions encountered. Both were classified in 1947 with that on the Lee farm being Moyock fine sandy loam and that on the Presson farm being Lenoir fine sandy loam. Present tile drainage practices, which were based upon the experience of drainage specialists, indicate that the spacing between tile laterals in Moyock soils may be approximately twice that which seems to be suitable in Lenoir soils (for a given tile depth). When considered on a preliminary basis, the experimental data confirms the present practices for these two conditions."

Sedimentation Studies - Louis M. Glymph, Jr., Lincoln, Nebraska. - "A number of different activities were engaged in during the month:

1. Results of the sedimentation survey made on Ashland Reservoir, near Columbia, Mo., were recomputed based upon a more reliable date for beginning of storage in the reservoir.
2. At the request of Mr. Harold Engstrom, Soil Conservation Service representative on the Missouri Basin Field Committee, selected data on rates of soil loss by sheet erosion in the Missouri Basin were summarized.
3. A conference was held with Mr. D. C. Bondurant, Army Engineer's Sedimentation Specialist Missouri River Division, concerning rates of sediment accumulation in Corps of Engineer reservoirs in the Basin.
4. A study was made of the relations of rates of sediment production, rates of reservoir storage depletion, and reservoir trap efficiency.
5. Arrangements were made to harvest corn for records of yield on the flood plain plots established following the flood of May 8 and 9, 1950.

Sedimentation Studies - Russell Woodburn, State College, Mississippi.-

"The project supervisor received an invitation from the Mississippi Economic Council to address their group at Jackson, Miss, November 2nd, on the subject of Water Resources and Problems in Mississippi.

"Since the invitation was tendered by Mr. R. D. Morrow, a member of the Board of Trustees of Institutions of Higher Learning in the State, and cooperative relations were involved the invitation was accepted. An excellent opportunity was also thereby given to bring some sedimentation problems before a new State level group. Considerable time was spent during the month on research in ground water, stream pollution, and related angles of the overall water problem in the State. Ample materials on the soil conservation and sedimentation parts of the problem were available without much search.

"On October 25 and 26, a trip was made to Hernando, DeSoto County, Miss., in company with Dr. Randall Jones, Associate Director, Miss. Experiment Station, Dr. Dale Hoover, Head of Agronomy, Mississippi State College and Experiment Station, and Dr. H. B. Vanderford, Professor of Soils.

"A conference was held with county agricultural workers, the State Soil Scientist, Mr. Dave Webb, and Dr. U. S. Ligon, Inspector of Soils, BPISAE, Knoxville, Tenn., in regard to problems involved where three agencies are mapping soils in the same county.

"The Experiment Station and BPISAE want certain information on their basic soil survey of the county.

"Soil Conservation Service wants the same information plus additional specialized data needed in the Operations program.

"The farmers and county workers do not understand why it is necessary for two sets of soil surveyors to visit each farm. They desired cooperation between agencies involved and elimination of dual mapping.

"An ingenious compromise was worked out which appears to have the possibility of pleasing everyone. I was concerned in the matter particularly from the standpoint

of Soil Conservation Service as the county in question is in the Yazoo flood control area and conservation mapping may be of major concern to us in evaluation of the sediment producing characteristics of a watershed.

"I was also concerned from the standpoint of cooperative relationships between the Experiment Station and Soil Conservation Service Research."

IRRIGATION AND WATER CONSERVATION DIVISION

Los Angeles West Coast Investigation - Harry F. Blaney, Los Angeles, California.-"The 15th Conference of Engineering Advisory Committee of the West Coast Basin water resources survey, called by the State Engineer of California on October 5 was attended with V. S. Aronovici in connection with the State cooperative research study being made by the Soil Conservation Service on consumptive use of water and penetration of rainfall and irrigation water below the root zone. Representatives of interested parties from the State, Los Angeles County Flood Control District, cities, power companies, water companies and oil companies attended the meeting to discuss the basic data compiled to date. The Division of Irrigation was requested by the State to extend its study through the water year ending September 30, 1950."

Soil Moisture Characteristics Studies - V. S. Aronovici, Pomona, California.-"In table 1 a comparison is made of the infiltration rate as observed in the irrigation furrow with the rate of infiltration as observed by infiltrometers, and with the observed rates of Uhland-type permeameters as measured in the laboratory. Note in the last column under the general heading of Uhland-type permeameters, the depth increment from 0-12 inches. This was secured by taking the four depth increments of 0-3, 3-6, 6-9, and 9-12 inches, and fitting the cylinders carefully end to end. This unit was then processed in very much the same way as a single 3-inch core. The only major difference being that the rate of water entry into the column was measured rather than the quantity of effluent water. Note that the minimum rate of the 0-12 inch composite sample is identical to the lowest rate observed in the four individual samples. In short, it appears that the over-all permeability rate of the composite core cannot exceed the lowest rate of any component part.

Table 1.--Comparative infiltration rates--Donnelly Plot, Riverside, Calif.

Elapsed Hours	Furrow Ins./Hr.	Infiltrimeters 1/ No. 1 No. 2		Uhland-type permeameter 1/ 0-3" 3-6" 6-9" 9-12" 0-12" 2/				
		Ins./Hr.	Ins./Hr.	Ins./Hr.	Ins./Hr.	Ins./Hr.	Ins./Hr.	Ins./Hr.
0.5	1.70	2.20	-	-	-	-	-	0.90
1.0	.88	1.47	1.37	0.87	0.68	-	0.30	.42
1.5	.94	.80	.87	.74	.32	0.40	.25	.35
2.0	.97	.49	.43	.84	.29	.35	.20	.26
2.5	.97	.46	.29	.56	.26	.25	.19	.22
3.0	.96	.43	.27	.52	.24	.22	.18	.20
3.5	.97	.35	.26	.48	.22	.20	.17	.17
4.0	.92	.28	.24	.46	.20	.18	.16	.16
4.5	.95	.22	.23	.45	.17	.17	.16	.16
5.0	.97	.22	.22	.43	.14	.16	.15	.13
5.5	.95	.21	.21	-	-	-	.14	.13
6.0	.92	.21	.21	-	-	-	.13	.12
6.5	.90	.21	.21	-	-	-	.13	.12
7.0	.88	-	-	-	-	-	.13	.12
7.5	.87	-	-	-	-	-	-	-

1/ Values on this table are derived from plotting rates against time and interpolating to secure common time intervals.

2/ Four 3" x 3" cores were stacked together and permeability observations were made of the composite. Intake rates were used to measure permeability."

Water-Law Study Revision - Wells A. Hutchins, Berkeley, California.-

"As was noted on the report for September, statements of the water-law doctrines of the Western States were being prepared for use of the President's Water Policy Commission, which had asked that these statements be completed by November 1. The last one was finished October 31 and sent to the Commission by air mail.

"It is planned to enlarge these statements somewhat, so that if the Operations personnel want them, they will be available for their use. When this work is completed, it will be presented to Mr. Clyde for consideration as to further use."

Snow Surveys and Irrigation Water Supply Forecasts - Homer J. Stockwell, Ft. Collins, Colorado.-"It was determined that a reduced number of measurements would give near the same average as the former course for the period of record. Mr. Washichek established two new courses during the month at the request of the Bureau of Reclamation. One was on the Blue River in Central Colorado and one on the North Platte in Wyoming. He has maintained snow courses and visited cooperators in the Gunnison National Forest area. He also worked with the State Engineer's office in Denver to bring our record of storage in major private reservoirs over the State of Colorado up to date.

"Approximately 2 weeks were spent in Southern Colorado and New Mexico maintaining snow courses and cooperative relationships on the snow survey program. One new snow course on Costilla Creek was established at the request of the State Engineer of New Mexico. Two courses, established last year in cooperation with the Atomic Energy Commission, were abandoned by that organization due to a change of plans for a source of water. One of these courses will be continued by the State Engineer with the Atomic Energy Commission furnishing an over-snow vehicle. During this trip tentative arrangements were made for the second annual meeting of the Rio Grande Forecast Committee on April 13, 1951, probably at Albuquerque.

Evapo-transpiration studies - Clyde E. Houston, Reno, Nevada.-"Average temperatures continued high during October with the alfalfa and pasture plots continuing growth. A summary of the alfalfa field plot up to October 1 shows that there were 62.8 inches of water applied to the plot, with 14 inches or 22 percent flowing off, and 23 inches or 37 percent going to deep percolation. This left 25.8 inches or 49 percent of the irrigation water consumptively used. As a check on the consumptive use figure, climatological data for the period April 15 to October 1 of this year were used in the Blaney - Criddle formula to compute consumptive use of irrigation water. This computed figure of 25.8 inches for this year checks with the 25.8 inches actually determined from soil and water measurements."

Irrigation Studies - Leonard J. Erie, Brookings, South Dakota.-"Crop yields are indicating considerably higher possibilities than were first thought possible in this proposed irrigation area."

"The seemingly very poor internal drainage and the naturally flat topography emphasizes the need for information on, 'how small an amount of irrigation water must we apply to obtain satisfactory yields' and 'how can this water be best applied.'"

Irrigation Studies - P. Earl Ross, Meslaco, Texas.-"A field trip with R. C. Barnes and Leon Alexander, Work Group Engineer and Work Unit Engineer respectively, of SCS Work Group 58, was made for the purpose of reviewing the irrigation systems designed and installed by Operations and discussing the functioning of various systems. Some 25 recently designed and installed systems were studied.

It appears that more land leveling for irrigation is being done in the Valley than ever before and that the limiting factor to leveling operation is equipment for earth moving. The landowners to whom we talked were, without exception, well pleased with the results they were getting from land leveling. We agree with Operations personnel that more information should be gathered and given to the landowner on how much water to apply and when to apply the water to crops or the soil. This entails practical means for farmers to measure irrigation water, more information regarding root zones of various crops, more information on water-holding capacities of various soils, and so forth. It is planned to make some more irrigation application efficiencies on various soil groups this winter."

12/18/50

